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EXAMINER

SHAH, PARAS D

ART UNIT	PAPER NUMBER
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2626

NOTIFICATION DATE	DELIVERY MODE
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ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

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Office Action Summary	Application No. 10/722,285	Applicant(s) SHRIVASTAV, RAHUL	
	Examiner PARAS SHAH	Art Unit 2626	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 04 June 2009.
- 2a) ☒ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,3-11,13-21,23-54 and 56-58 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,3-11,13-21,23-54 and 56-58 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. This communication is in response to the Arguments and Amendments filed on 02/09/2010. Claims, 1, 3-11, 13-21, 23-54, 56-58 are pending and have been examined, with claims 56-58 being newly added, and claim 55 being cancelled. The Applicant's arguments and amendments have been considered, but they do not place this case in condition for Allowance. Accordingly, this action has been made FINAL.
2. All previous objections and rejections directed to the Applicant's disclosure and claims not discussed in this Office Action have been withdrawn by the Examiner.

Response to Arguments

3. Applicant's arguments with respect to claims 1, 3-11, 13-21, and 23-54 have been considered but are not persuasive for the reasons noted below.

With respect to the 35 USC 103 rejections, the Applicant on page 12-13 argues that there is no motivation for Bayya to process voice signals using an auditory model since Bayya is interested in measuring corrupted speech in a communication medium. The examiner respectfully disagrees with this assertion. Sufficient motivation is present in combining the teachings of Treurniet with those teachings of Bayya. The auditory model of Treurniet provides an improvement upon Bayya, where Treurniet enables the perceptual quality of an audio or speech sequence to be obtained (see col. 2, lines 20-26). Further, Treurniet's perceptual quality is performed within a communication system for monitoring audio transmission (see col. 2, lines 20-26, col. 1, lines 35-50, and col. 12, lines 35-40). Hence, the Applicant's arguments are not persuasive.

Further, on page 13, the Applicant argues that Bayya does not teach determining or identifying voice quality attributes since Bayya teaches only measuring distortion of a signal in a communication network. The examiner respectfully disagrees with this assertion. The Examiner notes that claims broadly recite voice quality attributes being compared. Applicants note that the voice signal does not have to pass through a communication system but can. It is unclear as to how Bayya is different since the signal can be any voice signal. Bayya does identify voice quality attributes prior to comparing. In col. 4, equation 6, $C_y(n)$ and $C_x(n)$, cepstral values are computed prior to obtaining a distance measure between the reference and the corrupted signal (see col. 4, lines 25-37), which determines the quality based on the distance comparison. Further, in response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections

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are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). The Applicant has not considered the reliance of the auditory processing from Treurniet for this limitation to supply the processed audio signal. Further, the Applicants argue that Bayya is concerned with distortion from communication systems. However, the claims at present do not exclude such an interpretation as the claims recite "identifying one or more attributes...of said voice signal." Hence, the Applicant's arguments are not persuasive.

Furthermore, on page 14, the Applicants argue that voice quality is different from quality of speech and thus Bayya teaches away from the claimed invention. The Examiner respectfully disagrees with this assertion. Applicant has not shown how voice quality is different from speech quality. In particular, Applicant's specification [0041], also pertains to determining quality of voice based on communication channels, which is in the field of Bayya and Treurniet. Hence, the Applicant's arguments are not persuasive.

With respect with the added limitation of "wherein each of the at least one measure of vocal quality are selected from the group consisting, of roughness hoarseness strain, and breathiness" such limitation has been mapped accordingly below.

Claim Objections

4. Claims 3, 6, 13, 16, 23, 26, 56-58 are objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous

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claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. The independent claims recite language of "at least one measure of vocal quality selected from...." If, for example, breathiness is selected then claims 6, 16, 26 would not further limit the independent claim from which it depends as the same measure of vocal quality is being selected. Similarly, the same can be applied for vocal quality of strain.

Claim Rejections - 35 USC § 103

5. **Claims 1, 3-5, 11, 13-15, 21, 23-25, and 31-54** are rejected under 35 U.S.C. 103(a) as being unpatentable over BAYYA et al. (US 6,446,038) in view of TREURNIET et al. (Patent No.: US 7,164,771) in view of DEAL et al. ("Some Waveform and Spectral Features of Vowel Roughness").

6. Regarding **claim 1**, BAYYA teaches a method of diagnosing voices comprising:
processing a voice signal ("receives an input corresponding to the corrupted speech signal", BAYYA, column 2, lines 49-50) (e.g. The speech signal corresponds to a speaker's voice from whom it was uttered);

identifying one or more voice quality attributes of said voice signal by analyzing said processed voice signal ("generates corresponding signals 18 representing the amount of distortion in the corrupted speech signal for each of the plurality of distortion measure utilized", BAYYA, column 3, lines 21-24 and col. 3-4, equations 1-6, power spectra, LPC, cepstral values are calculated in order to calculate distortion measure)

(e.g. The speech signal corresponds to a speaker's voice from whom it was uttered, where attributes of the speech signal are identified);

comparing said one or more voice quality attributes of said voice signal with one or more baseline vocal quality attributes derived from at least one baseline voice signal values (see col. 3, lines 1-8 and see equation 6 using these cepstral values to determine a distortion measure) in order to determine at least one measure of vocal quality of the voice signal (see BAYYA, columns 3-4, equations 1-6 and see col. 4, lines 53-59, where the speech quality is evaluated in several dimensions including naturalness)

However, BAYYA does not disclose using an auditory model.

In the same field of field of quality measurement, TREURNIET teaches processing a voice signal using an auditory model to produce a processed voice signal ("peripheral ear processor 22 that processes signals according to a peripheral ear model", TREURNIET, column 4, lines 24-25).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to use the peripheral ear model of TREURNIET to process the input received by BAYYA in order to better estimate how the signal will be perceived (see TREURNIET, column 2, lines 19-22).

However, BAYYA in view of TREURNIET do not disclose wherein each of the at least one measure of vocal quality are selected from the group consisting, of roughness hoarseness strain, and breathiness.

In the same field of speech quality measurement, DEAL discloses a method of measuring vocal roughness. DEAL teaches a measure of voice quality that is at least one of roughness and hoarseness (“provide a quantitative acoustic index predictive of perceived vowel roughness”, DEAL, p. 251, 4th paragraph, where vowel roughness is associated with voice roughness and hoarseness, see DEAL, p. 251, 2nd paragraph).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to use the measurement method of DEAL as one of the distortion measures of BAYYA in order to increase the versatility of the quality measurement by determining vowel quality contained in a speech signal (see DEAL, page 250, last three lines of 1st paragraph), which would benefit the teachings of Bayya, which also suggests the determination of the naturalness of a speech signal. The incorporation of Deal enables the naturalness of individual components of the speech signal to be further analyzed for possible variability among speakers (see Deal page 250, Abstract).

7. Regarding **claim 11**, BAYYA teaches a system for diagnosing voices comprising:
process a voice signal voice signal (“receives an input corresponding to the corrupted speech signal”, BAYYA, column 2, lines 49-50) (e.g. The speech signal corresponds to a speaker's voice from whom it was uttered);

identify one or more voice quality attributes of said voice signal by analyzing said processed voice signal (“generates corresponding signals 18 representing the amount of distortion in the corrupted speech signal for each of the plurality of distortion measure

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utilized”, BAYYA, column 3, lines 21-24 and col. 3-4, equations 1-6, power spectra, LPC, cepstral values are calculated in order to calculate distortion measure) (e.g. The speech signal corresponds to a speaker's voice from whom it was uttered, where attributes of the speech signal are identified);

compare said one or more voice quality attributes of the voice signal with one or more baseline vocal quality attributes derived from at least one baseline voice signal quality attributes values (see col. 3, lines 1-8 and see equation 6 using these cepstral values to determine a distortion measure) in order to determine at least one measure of vocal quality of said voice signal (see BAYYA, columns 3-4, equations 1-6)

However, BAYYA does not disclose using an auditory model.

In the same field of field of quality measurement, TREURNIET teaches process a voice signal using an auditory model to produce a processed signal (“peripheral ear processor 22 that processes signals according to a peripheral ear model”, TREURNIET, column 4, lines 24-25).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to use the peripheral ear model of TREURNIET to process the input received by BAYYA in order to better estimate how the signal will be perceived (see TREURNIET, column 2, lines 19-22).

However, BAYYA in view of TREURNIET do not disclose wherein each of the at least one measure of vocal quality are selected from the group consisting, of roughness hoarseness strain, and breathiness.

In the same field of speech quality measurement, DEAL discloses a method of measuring vocal roughness. DEAL teaches a measure of voice quality that is at least one of roughness and hoarseness (“provide a quantitative acoustic index predictive of perceived vowel roughness”, DEAL, p. 251, 4th paragraph, where vowel roughness is associated with voice roughness and hoarseness, see DEAL, p. 251, 2nd paragraph).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to use the measurement method of DEAL as one of the distortion measures of BAYYA in order to increase the versatility of the quality measurement by determining vowel quality contained in a speech signal (see DEAL, page 250, last three lines of 1st paragraph), which would benefit the teachings of Bayya, which also suggests the determination of the naturalness of a speech signal. The incorporation of Deal enables the naturalness of individual components of the speech signal to be further analyzed for possible variability among speakers (see Deal page 250, Abstract).

8. Regarding **claim 21**, BAYYA teaches a machine readable storage, having stored thereon a computer program having a plurality of code sections executable by a machine for causing the machine to perform the steps of:

processing a voice signal (“receives an input corresponding to the corrupted speech signal”, BAYYA, column 2, lines 49-50) (e.g. The speech signal corresponds to a speaker's voice from whom it was uttered);

identifying one or more attributes of said voice signal by analyzing said processed voice signal ("generates corresponding signals 18 representing the amount of distortion in the corrupted speech signal for each of the plurality of distortion measure utilized", BAYYA, column 3, lines 21-24 and col. 3-4, equations 1-6, power spectra, LPC, cepstral values are calculated in order to calculate distortion measure) (e.g. The speech signal corresponds to a speaker's voice from whom it was uttered, where attributes of the speech signal are identified);

comparing said one ore more voice quality attributes of said voice signal with one or more baseline vocal quality attributes derived from at least one baseline voice signal values (see col. 3, lines 1-8 and see equation 6 using these cepstral values to determine a distortion measure) in order to determine at least one measure of vocal quality of said voice signal (see BAYYA, columns 3-4, equations 1-6),

However, BAYYA does not disclose using an auditory model.

In the same field of field of quality measurement, TREURNIET teaches processing, via the computer (see col. 12, lines 28, implemented using a computer systems and see col. 3, lines 3-5, system is implemented in a computer), a voice signal using an auditory model to produce a processed voice signal ("peripheral ear processor 22 that processes signals according to a peripheral ear model", TREURNIET, column 4, lines 24-25).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to use the peripheral ear model of TREURNIET to

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process the input received by BAYYA in order to better estimate how the signal will be perceived (see TREURNIET, column 2, lines 19-22).

However, BAYYA in view of TREURNIET do not disclose wherein each of the at least one measure of vocal quality are selected from the group consisting, of roughness hoarseness strain, and breathiness.

In the same field of speech quality measurement, DEAL discloses a method of measuring vocal roughness. DEAL teaches a measure of voice quality that is at least one of roughness and hoarseness ("provide a quantitative acoustic index predictive of perceived vowel roughness", DEAL, p. 251, 4th paragraph, where vowel roughness is associated with voice roughness and hoarseness, see DEAL, p. 251, 2nd paragraph).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to use the measurement method of DEAL as one of the distortion measures of BAYYA in order to increase the versatility of the quality measurement by determining vowel quality contained in a speech signal (see DEAL, page 250, last three lines of 1st paragraph), which would benefit the teachings of Bayya, which also suggests the determination of the naturalness of a speech signal. The incorporation of Deal enables the naturalness of individual components of the speech signal to be further analyzed for possible variability among speakers (see Deal page 250, Abstract).

9. Regarding **claim 3**, DEAL discloses a method of measuring vocal roughness. DEAL teaches a measure of voice quality that is at least one of roughness and hoarseness (“provide a quantitative acoustic index predictive of perceived vowel roughness”, DEAL, p. 251, 4th paragraph, where vowel roughness is associated with voice roughness and hoarseness, see DEAL, p. 251, 2nd paragraph).

10. Regarding **claim 4**, DEAL further teaches that the one or more voice quality attributes of said voice signal include changes in pitch over time and changes in loudness over time (“acoustic measures of period and amplitude variation”, DEAL, p. 251, 4th paragraph).

11. Regarding **claim 5**, DEAL further teaches that the one or more voice quality attribute of said voice signal includes a measure of partial loudness (“acoustic measures of... spectral noise level”, DEAL, p. 251, 4th paragraph).

12. Regarding **claim 13**, DEAL discloses a method of measuring vocal roughness. DEAL teaches a measure of voice quality that is at least one of roughness and hoarseness (“provide a quantitative acoustic index predictive of perceived vowel roughness”, DEAL, p. 251, 4th paragraph, where vowel roughness is associated with voice roughness and hoarseness, see DEAL, p. 251, 2nd paragraph).

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13. Regarding **claim 14**, DEAL further teaches that the one or more voice quality attributes voice quality attributes of the test voice signal include changes in pitch over time and changes in loudness over time (“acoustic measures of period and amplitude variation”, DEAL, p. 251, 4th paragraph).

14. Regarding **claim 15**, DEAL further teaches that the one or more voice quality attributes voice quality attribute of the test voice signal includes a measure of partial loudness (“acoustic measures of... spectral noise level”, DEAL, p. 251, 4th paragraph).

15. Regarding **claim 23**, DEAL discloses a method of measuring vocal roughness. DEAL teaches a measure of voice quality that is at least one of roughness and hoarseness (“provide a quantitative acoustic index predictive of perceived vowel roughness”, DEAL, p. 251, 4th paragraph, where vowel roughness is associated with voice roughness and hoarseness, see p. 251, 2nd paragraph).

16. Regarding **claim 24**, DEAL further teaches that the one or more voice quality attributes voice quality attributes of the test voice signal include changes in pitch over time and changes in loudness over time (“acoustic measures of period and amplitude variation”, DEAL, p. 251, 4th paragraph).

17. Regarding **claim 25**, DEAL further teaches that the one or more voice quality attributes voice quality attribute of the test voice signal includes a measure of partial loudness (“acoustic measures of... spectral noise level”, DEAL, p. 251, 4th paragraph).

18. Regarding **claims 31, 39, and 47**, BAYYA further teaches recording a voice signal (see col. 2, lines 54, microphone receives corrupted speech); generating a voice signal based on the recording of the speaker’s voice (see col. 2, lines 53-54, A/D converter).

19. Regarding **claims 32, 40, and 48**, BAYYA further teaches wherein the one or more baseline vocal quality attributes are derived from at least one baseline voice signal (“the speech reference vectors 16 are obtained from a large number of clean speech samples”, BAYYA, column 2, lines 57-58) (e.g. The reference and the distorted speech are compared. The baseline vocal quality is derived from reference signal, which is based on various speech references (see col. 2, lines 57-60). Vocal quality evaluated in terms of distortion (see col. 5, lines 28-34)).

20. Regarding **claims 33, 41, and 49**, BAYYA further teaches wherein the one or more baseline vocal quality attributes are associated with at least one baseline measure of vocal quality of a human speaker (see col. 4, equation , where the cepstral

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coefficients are used in calculating a distortion measure between the input and reference).

21. Regarding **claims 34, 42, and 50**, BAYYA further teaches wherein the at least one objective measure of voice quality of the voice signal defines a degree of vocal quality of the voice signal (“value between 1 and 5”, BAYYA, column 5, line 6) relative to the at least one baseline measure of vocal quality of a human speaker (“the speech reference vectors 16 are obtained from a large number of clean speech samples”, BAYYA, column 2, lines 57-58 and see col. 2, lines).

22. Regarding **claims 35, 43, and 51**, BAYYA further teaches, wherein the at least one measure of voice quality is an objective measure of voice quality (“predicting the subjective scores corresponding to the quality of speech based on the objective measurements”, BAYYA, column 4, lines 58-59).

23. Regarding **claims 36, 44, and 52**, TREURNIET further teaches, wherein the auditory model is a transfer function corresponding to a human auditory system (see col. 4, lines 49-52, the peripheral ear model considers transfer characteristics and see col. 5, lines 26-37, especially equation shows a transfer function).

24. Regarding **claims 37, 45, and 53**, TREURNIET wherein the auditory model is a transfer function corresponding to an outer portion and middle portion of a human ear

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(see col. 5, lines 28, models effect of the ear canal and middle ear), an excitation pattern elicited on a basilar membrane (see col. 5, lines 5-11, localized basilar energy representation), within a cochlea (see col. 5, lines 10-15, where the spectral energy is mapped to a pitch scale that is linear with respect to the properties of the inner ear and see col. 4, lines 8-12, where the energy propagates to inner ear in which the cochlea contains the basilar membrane), and transduction of the excitation pattern into neural activity in fibers of an auditory nerve (see col. 5, lines 20-25, where the basilar membrane representations are determined and see col. 4, lines 15-20, where the peripheral ear model is modeled to transducing to neural activity via hair cells and passed to the brain using the auditory nerve.).

25. Regarding **claims 38, 46, and 54**, BAYYA teaches transmitting the voice signal through a communication channel (see col. 5, lines 47-54, where the speech signal is corrupted when received through from channel impairments or noise) prior to processing the voice signal (see col. 5, lines 54-58, where the corrupted speech signal is then processed).

19. **Claims 6-10, 16-20, and 26-30** are rejected under 35 U.S.C. 103(a) as being unpatentable over BAYYA et al. (US 6,446,038) in view of TREURNIET et al. (Patent No.: US 7,164,771), in view of DEAL and in further view of HILLENBRAND et al. ("Acoustic Correlates of Breathy Vocal Quality").

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20. Regarding **claim 6**, the combination of BAYYA in view of TREURNIET in view of DEAL teaches all of the claimed limitation of claim 1.

However, BAYYA in view of TREURNIET in view of DEAL do not disclose that the measure of voice quality is breathiness.

In the same field of speech quality measurement, HILLENBRAND discloses a method of measuring vocal breathiness. HILLENBRAND teaches a measure of voice quality that is breathiness (“acoustic measures in predicting breathiness ratings”, HILLENBRAND, *abstract*).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to use the measurement method of HILLENBRAND as one of the distortion measures of BAYYA in order to increase the versatility of the quality measurement and to include quality measurements that compare different speech signals with and without pathological conditions (see HILLENBRAND, page 311, Abstract)

21. Regarding **claim 7**, HILLENBRAND further teaches that the one or more voice quality attributes voice quality attribute of the test voice signal includes a measure of low frequency periodic energy (“aspiration noise is inherently weak in the low frequencies”, HILLENBRAND, p. 312, 2nd paragraph, meaning the low frequencies contain a strong periodic component).

22. Regarding **claim 8**, HILLENBRAND further teaches that the one or more voice quality attributes voice quality attribute of the test voice signal includes a measure of high frequency aperiodic energy (“periodic component of the voice source is inherently weak in the mid and high frequencies”, HILLENBRAND, p. 312, 2nd paragraph, meaning the mid and high frequencies contain a strong aperiodic component).

23. Regarding **claim 9**, HILLENBRAND further teaches that the one or more voice quality attributes voice quality attribute of the test voice signal includes a measure of partial loudness of a periodic signal portion of the test voice signal (“measure of the... average energy below 4 kHz”, HILLENBRAND, p. 315, 4th paragraph, where the low frequencies contain a periodic signal, see HILLENBRAND, p. 312, 2nd paragraph).

24. Regarding **claim 10**, HILLENBRAND further teaches that the one or more voice quality attributes voice quality attributes of the test voice signal include a measure of noise in the test voice signal and a measure of partial loudness of the test voice signal (“measure of the average spectral energy at or above 4 kHz to the average energy below 4 kHz”, HILLENBRAND, p. 315, 4th paragraph, where the high frequencies contain noise and the low frequencies contain a periodic signal, see HILLENBRAND, p. 312, 2nd paragraph).

25. Regarding **claim 16**, the combination of BAYYA in view of TREURNIET in view of DEAL teaches all of the claimed limitation of claim 11.

However, BAYYA in view of TREURNIET in view of DEAL do not disclose that the measure of voice quality is breathiness.

In the same field of speech quality measurement, HILLENBRAND discloses a method of measuring vocal breathiness. HILLENBRAND teaches a measure of voice quality that is breathiness (“acoustic measures in predicting breathiness ratings”, HILLENBRAND, *abstract*).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to use the measurement method of HILLENBRAND as one of the distortion measures of BAYYA in order to increase the versatility of the quality measurement and to include quality measurements that compare different speech signals with and without pathological conditions (see HILLENBRAND, page 311, Abstract)

26. Regarding **claim 17**, HILLENBRAND further teaches that the one or more voice quality attributes voice quality attribute of the test voice signal includes a measure of low frequency periodic energy (“aspiration noise is inherently weak in the low frequencies”, HILLENBRAND, p. 312, 2nd paragraph, meaning the low frequencies contain a strong periodic component).

27. Regarding **claim 18**, HILLENBRAND further teaches that the one or more voice quality attributes voice quality attribute of the test voice signal includes a measure of high frequency aperiodic energy (“periodic component of the voice source is inherently

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weak in the mid and high frequencies”, HILLENBRAND, p. 312, 2nd paragraph, meaning the mid and high frequencies contain a strong aperiodic component).

28. Regarding **claim 19**, HILLENBRAND further teaches that the one or more voice quality attributes voice quality attribute of the test voice signal includes a measure of partial loudness of a periodic signal portion of the test voice signal (“measure of the... average energy below 4 kHz”, HILLENBRAND, p. 315, 4th paragraph, where the low frequencies contain a periodic signal, see HILLENBRAND, p. 312, 2nd paragraph).

29. Regarding **claim 20**, HILLENBRAND further teaches that the one or more voice quality attributes voice quality attributes of the test voice signal include a measure of noise in the test voice signal and a measure of partial loudness of the test voice signal (“measure of the average spectral energy at or above 4 kHz to the average energy below 4 kHz”, HILLENBRAND, p. 315, 4th paragraph, where the high frequencies contain noise and the low frequencies contain a periodic signal, see HILLENBRAND, p. 312, 2nd paragraph).

30. Regarding **claim 26**, the combination of BAYYA in view of TREURNIET in view of DEAL teaches all of the claimed limitation of claim 1.

However, BAYYA in view of TREURNIET in view of DEAL do not disclose that the measure of voice quality is breathiness.

In the same field of speech quality measurement, HILLENBRAND discloses a method of measuring vocal breathiness. HILLENBRAND teaches a measure of voice quality that is breathiness (“acoustic measures in predicting breathiness ratings”, HILLENBRAND, *abstract*).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to use the measurement method of HILLENBRAND as one of the distortion measures of BAYYA in order to increase the versatility of the quality measurement and to include quality measurements that compare different speech signals with and without pathological conditions (see HILLENBRAND, page 311, Abstract).

31. Regarding **claim 27**, HILLENBRAND further teaches that the one or more voice quality attributes voice quality attribute of the test voice signal includes a measure of low frequency periodic energy (“aspiration noise is inherently weak in the low frequencies”, HILLENBRAND, p. 312, 2nd paragraph, meaning the low frequencies contain a strong periodic component).

32. Regarding **claim 28**, HILLENBRAND further teaches that the one or more voice quality attributes voice quality attribute of the test voice signal includes a measure of high frequency aperiodic energy (“periodic component of the voice source is inherently weak in the mid and high frequencies”, HILLENBRAND, p. 312, 2nd paragraph, meaning the mid and high frequencies contain a strong aperiodic component).

33. Regarding **claim 29**, HILLENBRAND further teaches that the one or more voice quality attributes voice quality attribute of the test voice signal includes a measure of partial loudness of a periodic signal portion of the test voice signal (“measure of the... average energy below 4 kHz”, HILLENBRAND, p. 315, 4th paragraph, where the low frequencies contain a periodic signal, see HILLENBRAND, p. 312, 2nd paragraph).

34. Regarding **claim 30**, HILLENBRAND further teaches that the one or more voice quality attributes voice quality attributes of the voice signal include a measure of noise in the voice signal and a measure of partial loudness of the voice signal (“measure of the average spectral energy at or above 4 kHz to the average energy below 4 kHz”, HILLENBRAND, p. 315, 4th paragraph, where the high frequencies contain noise and the low frequencies contain a periodic signal, see HILLENBRAND, p. 312, 2nd paragraph).

35. **Claims 56-58** are rejected under 35 U.S.C. 103(a) as being unpatentable over BAYYA et al. (US 6,446,038) in view of TREURNIET et al. (Patent No.: US 7,164,771), in view of DEAL and in further view of HADJITODOROV et al. (“A computer system for acoustic analysis of pathological voices and laryngeal diseases screening”).

36. Regarding **claim 56-58**, the combination of BAYYA in view of TREURNIET in view of DEAL teaches all of the claimed limitation of claim 1.

However, BAYYA in view of TREURNIET in view of DEAL do not disclose that the measure of voice quality is strain.

In the same field of speech quality measurement, HADJITODOROV discloses a method of measuring vocal strain. HADJITODOROV teaches a measure of voice quality that is strain (“incomplete closure of the glottis”, HADJITODOROV, page 423, left column, sect. 2.4, where the laryngeal diseases associated with incomplete closure of glottis, formula TNI, which is used for the analysis).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to use the measurement method of HADJITODOROV as one of the distortion measures of BAYYA in order to increase the versatility of the quality measurement (multidimensional nature of voice) and to include quality measurements that compare different speech signals with and without pathological conditions (see HADJITODOROV, page 421, left column, 1st full paragraph).

Conclusion

37. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any

extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

38. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Shinohara et al. (US 6,718,217) is cited to disclose digital tone evaluation that measures the objective quality of a tone.

The NPL document by Berends is cited to audio quality determination based on perceptual measurements using a model of the human auditory system. Schonweiler et al. ("Novel Approach to Acoustical Voice Analysis Using Artificial Neural Networks") is cited to disclose analyzing and rating voice using ANN. Wester ("Automatic Classification of Voice Quality: Comparing Regression Models and Hidden Markov Models") is cited to disclose classification of voice quality through regression and HMMS.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Paras Shah whose telephone number is (571)270-1650. The examiner can normally be reached on MON.-THURS. 7:30a.m.-4:00p.m. EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Hudspeth can be reached on (571)272-7843. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2626

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/Paras Shah/
Examiner, Art Unit 2626

/David R Hudspeth/
Supervisory Patent Examiner, Art Unit 2626

04/29/2010